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A Few Millimeters via Thousands of Kilometers: An Asian 'Etched' Carnelian Bead in Early Makurian Nubia, Sudan

Introduction

In the region of the Fourth Cataract in Sudan, on the left bank of the Nile Valley between Khor Umm Ghizlan and Shamkhiya, several thousand beads were found during archaeological excavations over a 45 km area. The explorations were conducted under the direction of Dr Bogdan Żurawski on behalf of the Polish Centre of Mediterranean Archaeology of the University of Warsaw (PCMA UW) between 2004 and 2010. The 2008-2009 excavations at the Early Makurian burial site of El Ar 1 in Ab Naqaqir (the late 4th/early 5th century AD)[1] brought to light the most extraordinary find of an 'etched' carnelian bead unique to Sudan, which is the subject of the present article.

Once unearthed from an archaeological site, a bead raises questions concerning the time and distance it traveled to reach its destination. This paper is an attempt to provide a comprehensive approach to these issues by presenting the bead's material source and technique of production. The broad cultural, geographical and historical framework of 'etched' beads is shortly sketched here in an effort to contextualize the El-Ar bead. The burial setting of the bead may indicate the period of its final use, but not necessarily point to the time of manufacture or import. However, due to archaeological and literary sources, a potential path of its transport to the Fourth Cataract has been suggested.

The Nubian example

The double-shaft graves in Ab Naqaqir belonged to people of the highest social status. The smallest grave 27 was the only one not robbed and provided exceptionally rich assemblage of grave goods.[2] The bead find comes from double-shaft grave 27, containing a double burial of a male and a female. Associated with the female individual, the skeleton of which was classified as early matures, was a necklace with this bead (Colour-Fig. 1) (excavation inventory no.: El Ar 1/T27/24/08). The necklace is now stored in the National Museum in Warsaw (National Museum in Warsaw inv. no. 239042/1/a-j). It consists of 823 beads and 22 pendants: 700 long and short tubular shaped blue and green glazed faience beads, 91 barrel shaped drawn glass beads of various colours, 23 ostrich eggshell discs, 2 bone and 20 white quartz droplet pendants, 4 white quartz barrels and 3 carnelian beads drilled from both ends. All of them are known from Early Makurian grave assemblages,[3] with exception of the 'etched' carnelian bead (Colour-Fig. 2).

The bead has a standard truncated faceted square bi-cone shape[4] that is 10.32 mm in length, 7.13 in width and 6.73 mm in thickness. It measures 4.80 x 4.80 mm at the ends with a c. 1.20 mm diameter hole drilled on both ends, what resulted in double parallel perforation shape. The red coloured stone was decorated along the shorter edges with white lines and a single dot on every facet. The Nubian example is of an 'etched' white colour pattern applied to the naturally red surface of carnelian.

The shape of the carnelian bead has already been observed among Post Meroitic stone beads in the Fourth Cataract region.[5] There are no other published 'etched' examples that would provide a strict analogy for the bead under consideration.[6]

Carnelian beads – material and origins

Carnelian is a red to yellowish- or orange-red translucent semiprecious form of the silica mineral chalcedony quartz. Its physical properties are those of

1 Żurawski 2007: 208.
2 Żurawski 2007: 207.
3 Then-Obłuska, forthcoming.
4 Beck 1928: Type IX.C.2.f.
5 Then-Obłuska, forthcoming.
6 Arkell 1935; Beck 1930; Ibid. 1933; De Waele and Haernick 2006; Dikshit 1949; Dubin 2009; Francis 1980; Glover and Bellina 2001; Shiah 1944; Simpson 2003; Jasim 2006.

quartz. The red color of carnelian is due to the disseminated particles of tiny amounts of iron oxide (hematite).[7] These particles are enhanced by baking and dyeing with iron salts. Carnelian is a close relative of sard, differing only in its lighter shade of red and lesser hardness (7.0 on the Moh's scale). Its name derives from the Latin *cornum* (not *carnis*: flesh) and it is said to come from the berry of the cornel tree, a reference to the color of the flesh of its fruit. Carnelian is also referred to by other trade names like red chalcedony and red agate.[8] The term "agate" usually refers to the banded varieties of carnelian, while "chalcedony" typically refers to a stone that has been dyed to achieve its red color. The red colour of carnelian has always been responsible for the belief that it possesses the magic property of being good for the blood and so promoting fertility.[9]

Carnelian was one of the most popular semi-precious stones in the ancient Near East, in Egypt and India. A major source of carnelian in the Indo-Pakistani region was the Gujarat district of northwest India, but it is also found as pebbles in riverbeds, such as in the Hindu Kush.[10] Carnelian can be found elsewhere in Asia, as well as on the Arabian Peninsula. Numerous small water-worn pebbles of carnelian are found scattered across the surface of the desert in Egypt between the Nile Valley and the Red Sea, but larger stones occur at various specific sites in both the Eastern and Western Deserts.[11] Carnelian, agate and chalcedony occur in Sudan in the gravels of the Atbara River and are common in the Khasm el Girba region.[12] In the Fourth Cataract region they occur mainly in the form of rounded, polished pebbles and cobbles since they were transported through flowing water from their potential sources in the southeastern Bayuda Desert (Wadi Kurmit) and from the Blue Nile in the Sennar-Kasala region.[13]

The Asiatic origin of carnelian bead material in Sudan and in western regions of North Africa has already been the subject of research.[14] Although it would seem that its abundance and local availability questions that possibility, exports to these areas must have happened in the past. In Pakistan at the beginning of the twentieth century A.D., for example, material for bead production came from Gujarat, but 'the fine red carnelian used to come from Yemen in Arabia, and it is considered to be the best quality'.[15] However, archaeometrical laboratory analyses on the Indian source of carnelian material for beads found in Western Africa and Southeast Asia have neither given decisive results nor rejected the Indian origin so far.[16]

Etched carnelian beads – technique of production and decoration

The technique for producing carnelian beads has already been well presented in literature.[17] The pebbles were roasted to intensify their red colour through oxidization. This process also served to soften their cortex to facilitate the flaking off of blades from the core. However, carnelians vary in their resistance to heat and can lose their colour, especially if the heating was prolonged. 'Some stones of a deep red colour can be heated red hot with a minimum loss of colour or transparency. Others, apparently of the same grade, rapidly turn pink, or white and opaque. (…) This resistance may be proportionate to the degree of heat to which they have been subjected and it could be inherent in certain types of carnelian'.[18] Rough beads were formed through chipping and grinding on the coarse surface of metamorphic rocks. Next, the beads were bored from both ends. It seems that drilling was done before final shaping because of the risk of breaking the bead. Finally, the bead was polished, decorated and reheated to bring back smoothness and shine.[19]

The application of an 'etched' decoration was developed to imitate even rarer naturally patterned stones. There are three types of paint application according to pattern colour and surface type identified.[20] These are white or black patterns on naturally coloured (usually red) bodies and black patterns on completely white, 'etched' bodies.

This 'etched' process of bead decorating was noticed in Pakistan and described in detail by Bellasis (1857), experimented on by Ernest Mackay (1933) and summed up by Peter Francis Jr. (1980).[21] Generally the bead was set in a holder made of clay mixed with a bit of cotton wool to prevent it from cracking so that it would protect the bead from the flames. After the pattern was drawn, the beads with their holders were

7 Aston, Harrell and Shaw 2000: 26-27.
8 Harrell 2010: 73.
9 Arkell 1935: 302.
10 Rapp 2009: 97.
11 Aston, Harrell and Shaw 2000: 27; Bloxam 2006.
12 Whiteman 1971: 258.
13 Harrell 2010: 72-73.
14 Arkell 1936; Insoll *et al*. 2004.
15 Mackay 1933: 145.
16 Theunissen, Grave and Bailey 2000; Insoll, *et al*. 2004.
17 Francis 2002: 148; De Waele and Haerinck 2006; Mackay 1933: 145-6.
18 Mackay 1933: 145-6.
19 De Waele and Haerinck 2006: 33.
20 Beck 1933; During Caspers 1972; Reade 1979.
21 Bellasis 1857; Mackay 1933; Francis 1980.

put on an iron sheet and placed on a charcoal fire for about five minutes. Next the bead was removed and cooled. The soot was then wiped off the bead.

For the pattern the 'etching paint' was prepared as a mix of washing soda, water and juice made from branches of the plant kirar (*Cappharis aphylla*).[22] However, the juice was not truly necessary; it was only helpful to see the soda during application since it made the mixture opaque. The alkali in the soda was responsible for the whitening.

Thus, the term 'etched' in the literature is a misnomer because the process does not involve acid or engraving. Laboratory analysis provides interesting results on this point.[23] A solution of alkali (sodium carbonate, potash, a lead salt, and sodium borate) in water, mixed with or without plant juices and other ingredients, was painted onto the bead in the desired designs before the bead was fired. The alkali penetrated the surface and spread out just under it. By reacting with the microcrystalline quartz (silica) of the stone the alkali acted as a flux to produce low-melting sodium-silicate glass visible as white lines. X-ray diffraction (XRD) laboratory analyses of other 'etched' carnelian beads proved that sodium carbonate (Na2CO3) causes voids 'which are produced through the dissolution of silica from the crystal boundaries of microcrystalline quartz'.[24] At the surface the concentration of voids is lower than in the deeper layers. The network of voids scatters light thus causing the white colour. However, traces of alkalis (soda and potash) were not detected in the SEM (Scanning Electron Microscopy) and EDAX (Energy Dispersive X-Ray) laboratory analyses.[25] They could have been removed from the etched areas through polishing or leaching the bead in soil. Also the possibility of the use of other staining agents in antiquity has been suggested.[26]

The 'etching' process has been replicated in recent times and appears to be a very complex one.[27] Good quality raw material, the smoothness of the surface, mastery of the alkaline production, as well as the heating process, each affects the 'etching' and requires expertise.

Etched carnelian beads - a long ancient tradition

The majority of scholars agree that the technique of painting carnelians originated with the Harappan Civilization around 2500 BC in the Indus Valley.[28] Horace Beck distinguished three chronological periods in which different patterns and forms were in use: Early Period (Harappan: from the 3rd to the beginning of the 2nd millennium BC), Middle Period (Early Historic: the 3rd century BC through/to the 2nd century AD) and Late Period (Early Islamic Period: the 6th to 10th centuries AD).[29] However the classification needs to be revised and updated specifically in the light of recent finds from India and Pakistan and outside this region.

The stylistic features of beads produced in the Early Period in the Indus valley (and most probably in Mesopotamia) were characterized by white circles, concentric circles, encircling lines and the "eye design". Exported examples, indicating early trade, were found in Iran, Central Asia and Mesopotamia.[30] In the latter case, they could also have been produced locally.[31]

The Middle Period group comprises spherical, barrel, tablet and faceted red beads decorated with lines along their edges and single dots. They were produced in northern and southern India, Thailand and Iran.[32] They were produced in Iran at least from Sasanian times. Many 'etched' carnelian beads, dated to the 1st century AD, with patterns of lines and dots were uncovered in pre-Islamic tombs, whose objects were comprised of a wide range of Roman and Parthian materials, at Dibba Al Hisn in Oman[33] and at a few sites in the United Arab Emirates.[34]
Late Group beads of roughly spherical or tablet shapes were decorated with scroll patterns, equal-armed crosses or 'devices'. These patterns were also found within the Sasanian Empire and in Early Islamic contexts.[35]

'The 'etched' carnelian beads that occur so often in India and the Middle East have not yet been found in East Africa".[36] They are, however, found in Ptolemaic and Roman contexts in Egypt,[37] and, from the evidence presented here, they are now known from Early Makurian Nubia.

The faceted shape and stylistic features of its decorative pattern – lines along edges and single dots

22 Simpson 2003: 65.
23 Tite 1986; Glover and Bellina 2003.
24 Glover and Bellina 2001.
25 Tite 1986; Glover and Bellina 2001: 195.
26 Ibid.
27 Glover and Bellina 2003: 95.
28 Dikshit 1949; Mackay 1933; Beck 1933.
29 Beck 1933.
30 Simpson 2003.
31 Reade 1979.
32 Francis 1980; 1999: 52; 2002: 148; Simpson 2003.
33 Jasim 2006.
34 De Waele and Haerinck 2006; Jasim 2006: 229.
35 Simpson 2003: 65-66.
36 van der Sleen, 1958: 210.
37 Shiah 1944; Francis 1980.

on the facets – place the Nubian example within the Middle Period[38] and the pre-Islamic beads.[39]

The Fourth Cataract etched carnelian bead in light of Indo-Pacific and Northeast African contacts

Stylistic features and the archaeological context set the production and distribution of the bead within a broad time span that includes the Meroitic (3rd century BC – 3rd centuries AD) and Early Makurian periods in Nubia (fourth – sixth centuries AD).

The bead may have been imported in the Meroitic period from India or Iran, with the possible mediation of southern Arabian and northeast African ports.[40] At that time, Italian imports reaching Meroitic Kush[41] were brought in *via* Roman Egypt or the Red Sea coast. One of these routes was undoubtedly the way this 'etched' carnelian bead arrived at the Fourth Cataract region of Nubia.

The long history of contact between the Red Sea and Indo-Pacific ports is demonstrated by textual, archaeological and archaeo-botanical sources.[42] Although some Indian cultural associations with Nubia have been suggested for the late 1st century BC and the first half of the 1st century AD, Nubia played a minor role in Indian Ocean trade.[43] It was possible to traverse through a narrow corridor leading from the vicinity of the Fourth Cataract of the Nile to the coast of the Red Sea at Ptolemais Theron, possibly identified with the region of Adobona near modern Suakin.[44] This Ptolemaic port was mentioned for the last time in the 1st century AD in the *Periplus Maris Erythrei* (13) as a place without a harbor, exporting turtle shell and lesser amounts of ivory on small boats.[45] Probably it served only Ptolemaic interests, was not of overseas fame, and rapidly declined.[46]

The *Periplus* also mentioned the port of Berenike to the north and a port of Adulis to the southeast, both trading with India. Their prosperity lasted much longer. Anchoring here, ships reached destinations farther than Ptolemais Theron. One of these destinations was Barygaza on the western coast of India. Its markets, among others available in that region, offered agate and carnelian destined for export to Egypt.[47]

The prosperity of the Red Sea port of Berenike from the 4th to the 5th centuries AD is well confirmed by ample archaeological evidence of extensive trade with India and Sri Lanka.[48] Items especially popular at the port city were Indo-Pacific glass beads.[49] It is interesting that in contrast to the small percentage of bead found in Ptolemaic and Early Roman levels at Berenike, South Indian drawn and rounded glass beads account for more than forty percent of imports from that area between the 4th and 6th centuries AD.[50]

There are some types of beads found to support the connections of the Red Sea coast with the hinterland of the Fourth Cataract region. These are beads and pendants made of Red Sea shells and coral. Coral beads (*corallium rubrum sp.*) were, at the same time, one of the main Mediterranean products imported to Roman and Coptic Egypt and exported through Roman Egypt to India.[51] The coral beads found in the Fourth Cataract region seem to be of the poorer quality variety originating in the Red Sea rather than that from the Mediterranean. They could have been transported to the Nile together with the Red Sea shells.

Textual sources suggest that from the 5th century onwards, the Blemmyes played an important role in Red Sea trade centered at the harbor of Berenike.[52] Among archaeological artifacts linking Berenike, the Eastern Desert and the Nile Valley are sherds of hand-made pottery called Eastern Desert Ware (EDW). They were produced between the 4th and 6th centuries AD and are associated with a population from the Eastern Desert and Lower Nubia, most probably Blemmyes. EDW was found within reach of the Fourth Cataract region, as far as Tabot, Kurgus and Wadi el-Tereif.[53]

EDW was also uncovered at Mons Smaragdus, where there were beryl and emerald mines situated in the Eastern Desert not far from the main track between Koptos and Berenike. According to Olympiodorus of Thebes, Mons Smaragdus was controlled by Blemmyes at the end of the 4th cen-

38 Beck 1933.
39 Yule 2001, Abb. 5.9; Jasim 2006: 229; De Waele and Haerinck 2006.
40 Jasim 2006.
41 Grzymski 2004: 167.
42 Mayerson 1993; Tomber 2008; Ray 2003; Sidebotham 2009; Cappers 1998; 2006.
43 Brook Abdu and Gordon 2004; Haaland 2009: 45; Ibid. 2013; Derrett 2002.
44 Sidebotham 2009: 167.
45 *Periplus Maris Erythrei.*
46 Sidebotham 2009: 167.
47 *Periplus Maris Erythrei* 48-49 and 51.
48 Sidebotham 2008: 174-181.
49 Francis 2002: 48.
50 Ibid.
51 Francis 2002: 156.
52 Djikstra 2005: 48; today all shells of the Red Sea species are proffered at Khartoum markets by members of the Eastern Desert tribe called the Beja, as could have happened in antiquity.
53 Barnard and Magid 2006; Barnard 2009.

tury AD. It is interesting that Cosmas Indicopleustes states that the Blemmyes provided 'Ethiopians' with emeralds for trade with India; this commercial activity continued into Arab times.[54] Between the 4th and 6th centuries AD, East Africa experienced the rise to prominence of the Aksumite kingdom, also a Byzantine contractor of Asian goods. At the same time, in Nubia the Meroitic Kushite kingdom fell and the Nubian kingdoms of Makuria, Nobadia and Alodia were formed. It was in Makuria, between Nobadia to the north and Alodia to the south, that the etched bead was uncovered. The nomadic Blemmyes of the Eastern Desert, who may have played a part in the transport of the bead, served as guides for those passing through Makuria's desert terrains, as indicated by the story of bishop Longinus being conducted to Alodia.[55]

In tracing the overseas trade contacts, black pepper of Indian origin is also of high significance. Together with the EDW, pepper was uncovered both in Berenike and to the southwest at Wadi Shenshef.[56] The greatest prosperity of that way station, where sapphire from Sri Lanka was also found, is dated between the fifth and sixth centuries AD by Eastern Mediterranean amphorae found there.[57] The presence of EDW and Indian peppercorns was also confirmed at the important site of Qasr Ibrim in the Nile Valley.[58] A Coptic letter to the Phylarchos of Noubadia, Tantani, dated to ca. AD 450 and from Qasr Ibrim, suggests the transport of pepper to Philae from Nubia.[59] This could indicate another direction for the transport of overseas items. In that period the pepper coming from the south might have been obtained from an Aksumite port.

The port of the Aksumite Kingdom, Adulis (near modern Massawa in Eritrea), may have been the place where objects such as the Asian bead from El Ar 1 were unloaded. The great number of Indo-Pacific beads in Aksumite burials seems to be very significant evidence pointing to this suggestion.[60] The highest prosperity of the port of Adulis is dated from the fourth to seventh centuries AD,[61] and the range of items traded through this port was mentioned in the work of Cosmas Indicopleustes (2.49), written in the 6th century AD. What is more, the presence of Mesopotamian Glazed Ware points to sea route connections with the Gulf.[62] The land route, coming to Nubia from the south, has some scanty archaeological data, including comparable EDW pottery from the Eastern Desert and Butana. This pottery represents the traces left by nomadic people crossing the Eritrean-Sudanese lowlands in the first half of the 1st millennium AD. These nomadic people "may have been partners when directly or indirectly involved in the caravan trade, or competitors, when acting as riders of Axumite traders".[63]

54 Djikstra 2005: 48.
55 John of Ephesus, chapt.53.
56 Cappers 1998; Ibid. 2006; Barnard 2009.
57 Cappers 2006; Sidebotham et al. 2008.
58 Cappers 2006: 117.
59 Obłuski, in press.
60 Harlow 2000: 83-6 (Aksum); Anfray & Anneequin 1965, pl. clv b (Matara).
61 Peacock and Blue 2007.

Summary

The only 'etched' carnelian bead from Nubia was found in the Fourth Cataract region at El Ar and associated with a female individual in a grave dated between the 4th and 6th centuries AD. The dating context in which the 'etched' bead was found is contemporary with a heightened presence of Asian bead objects at few Egyptian, Lower Nubian and Aksumite sites. An analysis of its stylistic tradition places the bead within a long period spanning the 3rd century BC to the 6th century AD, which is contemporaneous with the Meroitic and Early Makurian periods in Nubia. During this time, the bead was transported from its place of manufacture in the territory of ancient Iran or India. For both periods, archaeological and literary sources provide evidence of the high prosperity of the Red Sea ports as well as of their trade contact with the Indo-Pacific region. The 'etched' carnelian bead, once arriving at a North-East African port, then reached the Fourth Cataract region when transported through the Eastern Desert between the 4th and 6th centuries AD.

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62 Tomber 2008: 91.
63 Manzo 2004: 81.

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Zusammenfassung

Während der Rettungsarbeiten am Vierten Katarakt wurden hunderttausende Perlen ausgegraben. Eine außergewöhnliche „geätzte" Karneolperle, sicherlich ein asiatischer Import, ist in einem Grab mit einer weiblichen Bestattung aus der Early Makurian Period (4.-6. Jh. n. Chr.) gefunden worden. Der Artikel stellt den Hintergrund dieses einzigartigen Objektes in der Sudanesischen Geschichte dar, wobei die Materialanalyse und ein Überblick über die Tradition der geätzten Karneolperlen gegeben wird.

Zeitgenössische Altertümerplätze an der Küste des Roten Meeres liefern den Nachweis für zunehmende Handelskontakte mit der indo-pazifischen Region. Das Gebiet des Vierten Katarakts darin involviert, wahrscheinlich über die Aktivitäten der Wüstenbewohner. Der archäologische und historische Kontext dieser Kontakte zwischen Nordostafrika und dem indo-pazifischen Raum wird in einer interpretativen Analyse dargestellt.

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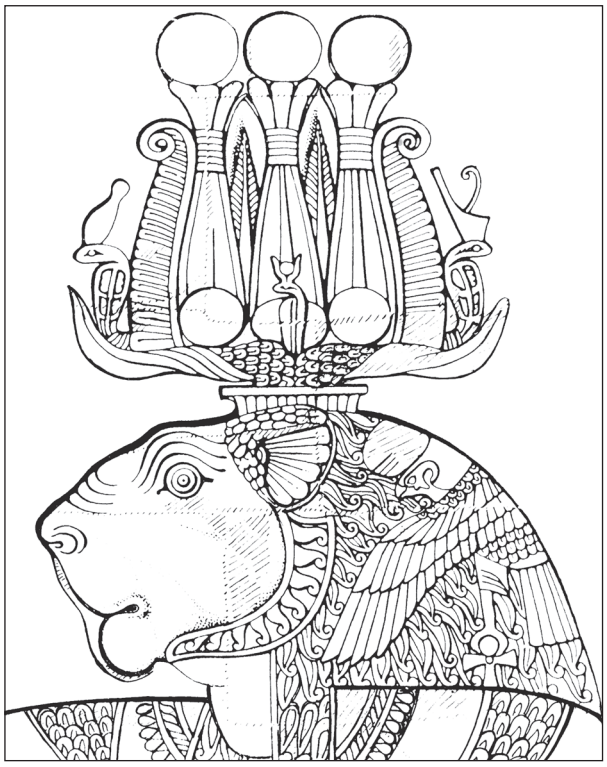

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Angesichts der Tatsache, daß die globalen wirtschaftlichen, ökonomischen und politischen Probleme auch zu einer Gefährdung der kulturellen Hinterlassenschaften in aller Welt führen, ist es dringend geboten, gemeinsame Anstrengungen zu unternehmen, das der gesamten Menschheit gehörende Kulturerbe für künftige Generationen zu bewahren. Eine wesentliche Rolle bei dieser Aufgabe kommt der Archäologie zu. Ihre vornehmste Verpflichtung muß sie in der heutigen Zeit darin sehen, bedrohte Kulturdenkmäler zu pflegen und für ihre Erhaltung zu wirken.

Die Sudanarchäologische Gesellschaft zu Berlin e.V. setzt sich besonders für den Erhalt des Ensembles von Sakralbauten aus meroitischer Zeit in Musawwarat es Sufra/Sudan ein, indem sie konservatorische Arbeiten unterstützt, archäologische Ausgrabungen fördert sowie Dokumentation und Publikation der Altertümer von Musawwarat ermöglicht. Wenn die Arbeit der Sudanarchäologischen Gesellschaft zu Berlin Ihr Interesse geweckt hat und Sie bei uns mitarbeiten möchten, werden Sie Mitglied! Wir sind aber auch für jede andere Unterstützung dankbar. Wir freuen uns über Ihr Interesse!

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